CENTER for PROFESSIONAL DEVELOPMENT
YOUR PARTNER FOR EDUCATION AND TRAINING

Thinking Outside the Box

A Rational Problem to Solve

Four people want to cross a bridge. They all begin on the same side. You have 17 minutes to get all of them across to the other side. It is nighttime, and there is only one flashlight.

A maximum of two people can cross the bridge at one time. Anyone who crosses the bridge, alone or with another person, must have the flashlight with them. The flashlight must be walked back and forth; it cannot be thrown, etc.

Each person walks a different speed. A pair must walk together at the rate of the slower person's pace.

Person 1: 1 minute to cross

Person 2: 2 minutes to cross

Person 3: 5 minutes to cross

Person 4: 10 minutes to cross

For example, if Person 1 and Person 4 walk across first, it will take 10 minutes. If person 4 returns with the flashlight, a total of 20 minutes have passed and you have failed the mission.

See how quickly you can solve this!

Jana Good

The Rational Problem Solving Model

Below is a simple, four-step model that describes the rational problem solving process. Other models contain as many as ten and twelve steps, but they are basically an elaboration of this model. Although models like this suggest a linear sequence of steps, neither groups nor individuals ordinarily proceed through the steps in this ideal sequence—nor do they necessarily consider all the ground suggested by the characteristics of the steps.

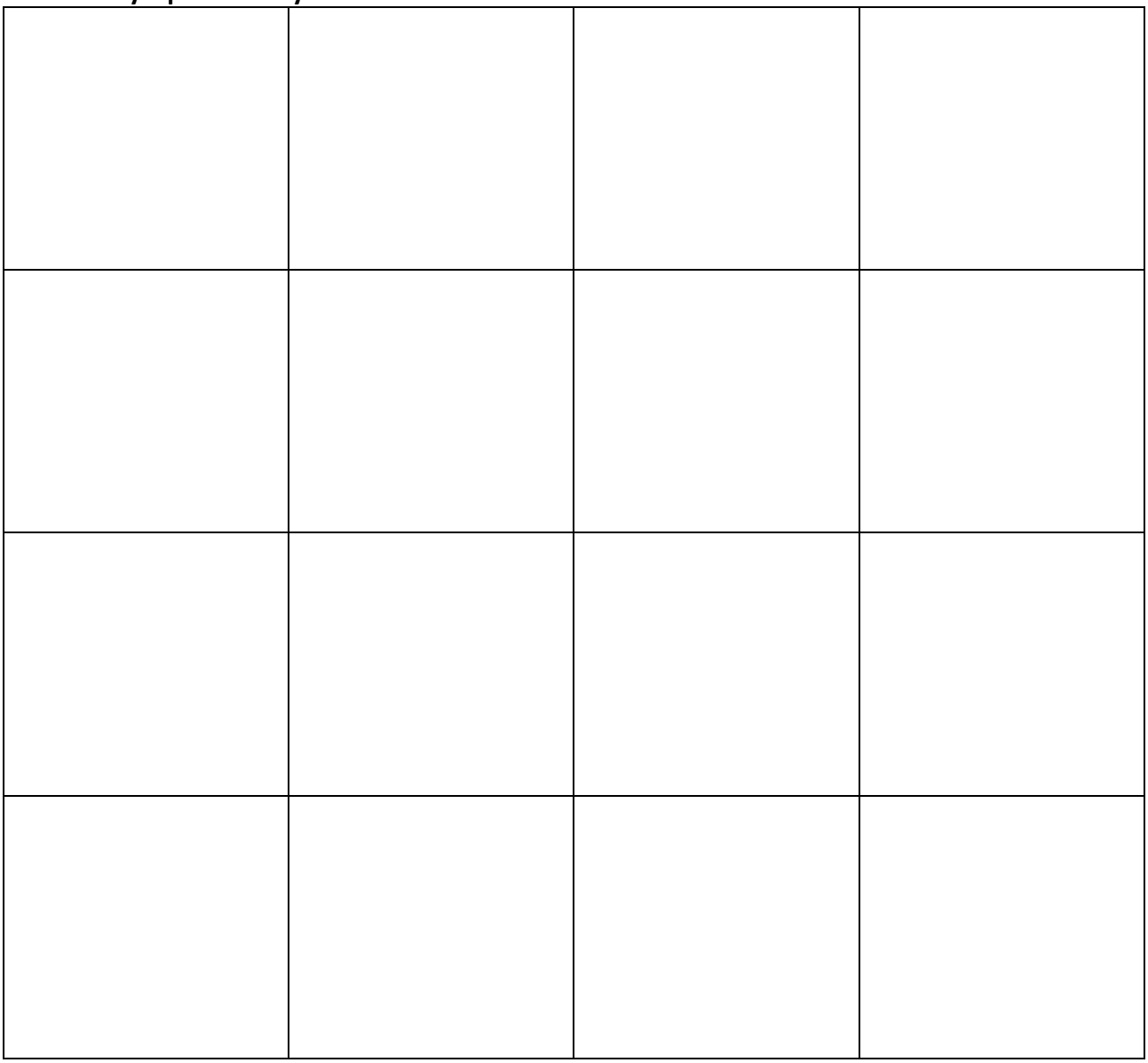
Steps	Characteristics
1. Define the problem	• Differentiate fact from opinion • Specify underlying causes • Tap everyone involved for information • State the problem explicitly • Identify what standard is violated • Determine whose problem it is • Avoid stating the problem as a disguised solution
2. Generate alternative solutions	• Postpone evaluating alternatives • Be sure all involved individuals generate alternatives • Specify alternatives that are consistent with goals • Specify both short-term and long-term alternatives • Build on others' ideas • Specify alternatives that solve the problem
3. Evaluate and select an alternative	• Evaluate alternatives relative to an optimal standard • Evaluate alternatives systematically • Evaluate alternatives relative to goals • Evaluate main effects and side effects • State the selected alternative explicitly
4. Implement and follow up on the solution	• Implement at the proper time and in the right sequence • Provide opportunities for feedback • Engender acceptance by those who are affected • Establish an ongoing monitoring system • Evaluate based on problem solution

Some Constraints on the Rational Problem Solving Model

Steps	Constraints
1. Define the problem	• There is seldom consensus in defining a problem • Whose definition will be accepted? • We usually define problems in terms of solutions we already have • Symptoms get confused with the real problem • Confusing info inhibits problem identification
2. Generate alternative solutions	• Alternatives for solutions are usually evaluated one at a time as they are proposed • Few of the possible alternatives are usually known • The first acceptable solution is usually accepted • Alternatives tend to be based on what was successful in the past
3. Evaluate and select an alternative	• Only limited information about each alternative is typically available • Search for information occurs close to home—in easily accessible places • The type of information available is constrained by factors such as primacy versus recency, extremity versus centrality, unexpected versus surprising and correlation versus causation • Gathering info on each alternative is costly • Preferences of which is the best alternative are not always known • Satisfactory solutions, not optimal ones, are usually accepted • Solutions are often selected by oversight, default • Solutions are often implemented before the problem is defined
4. Implement and follow up on the solution	• Others may not accept the solution • Resistance to change is a universal phenomenon • It is not always clear what part of the solutions should be monitored or measured in follow up • Political and organizational processes must be managed in any implementation effort • It may take a long time to implement a solution

Tools 1: Change your perspective

How many squares can you count?



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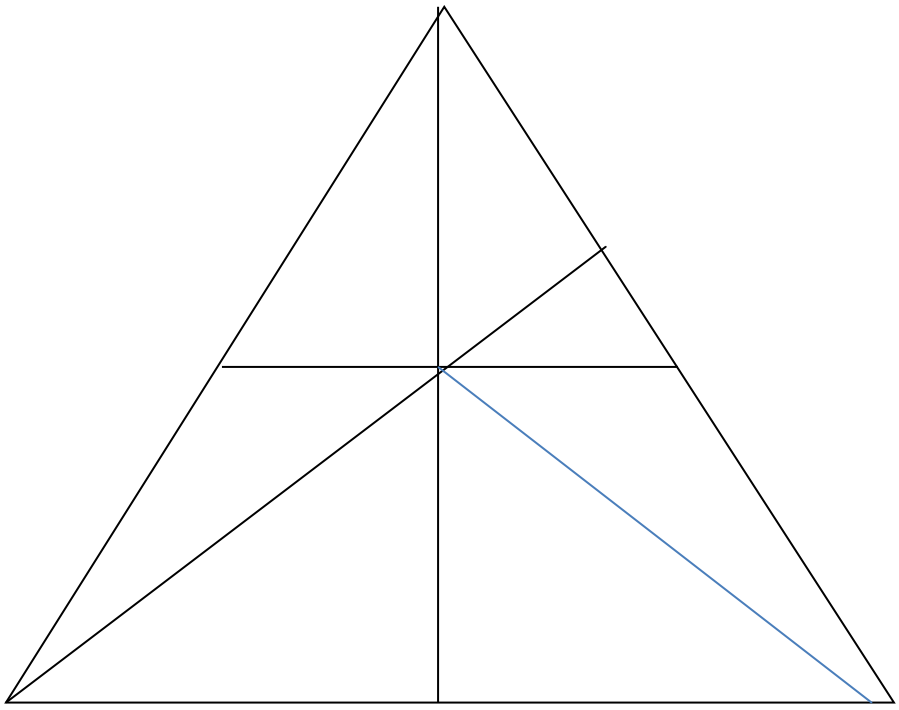
Tool 2: Find and define the problem

How many SMALL triangles (with no intersecting lines) can you count?



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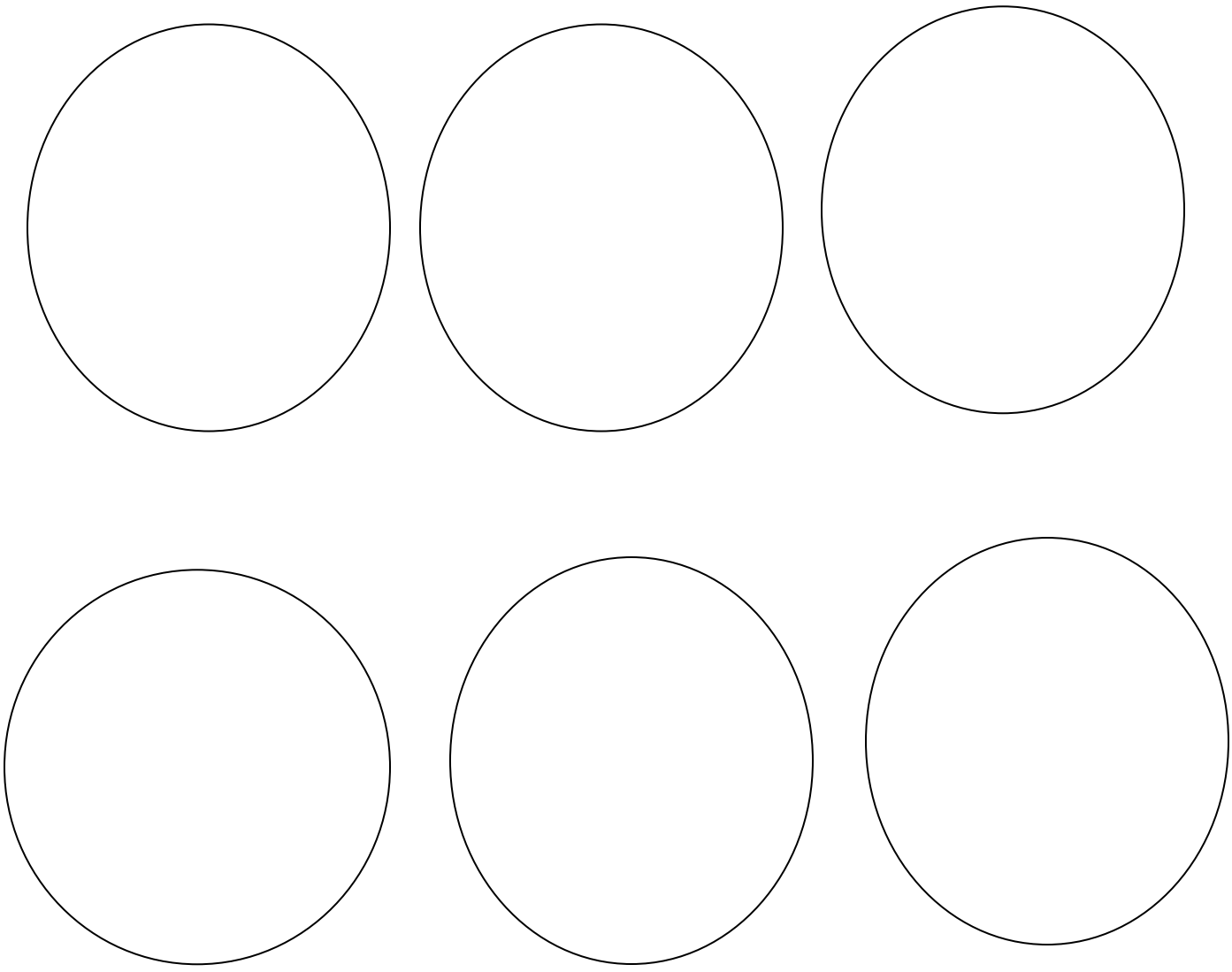
Tool 3. Identify your assumptions

Slice the pie into eight pieces using only three cuts



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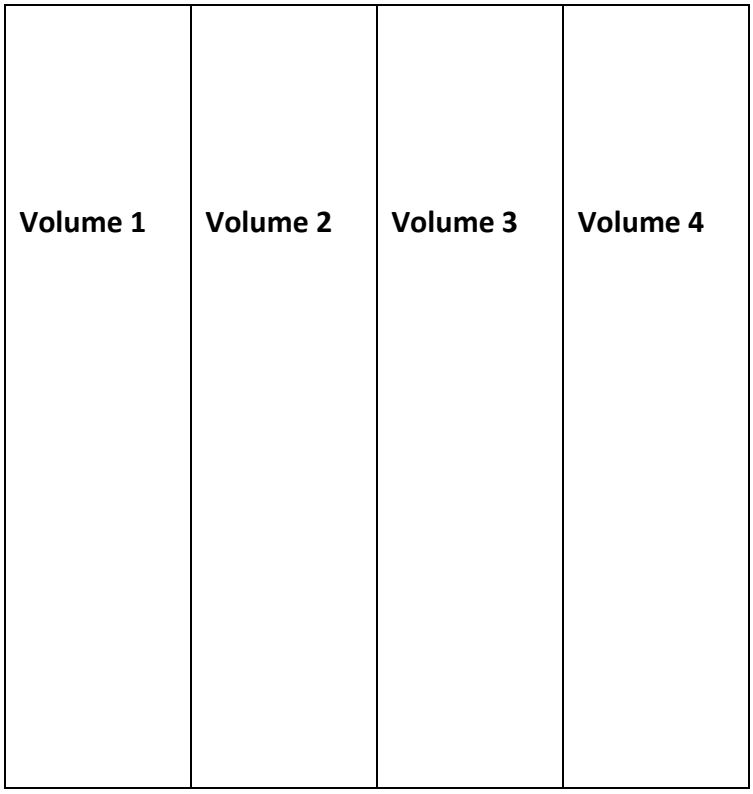
Tool 4: Reason concretely as well as abstractly

Four Classical Volumes

Four classical volumes form a set of books in the illustration below. The pages of each book are two inches thick. The book covers are each one sixth of an inch thick. A bookworm began eating his way from page 1 of the first volume and ate all the way through the last page of the fourth volume. What distance did the worm cover?



A Creative Problem to Solve

You are downstairs with only three light switches in front of you. Upstairs there are only three lights. Each switch is connected with a single light upstairs.

To start with, all the switches are in the off position (down) and the three lights are off. By flipping a switch on and off, the connected light upstairs will go on and off...but you cannot tell which light is from downstairs.

You are allowed to go upstairs only ONCE. Tell me how you determined which switch is connected to which light for ALL THREE LIGHTS!

Again, no tricks! The three lights are the same type bulb and they all work. There is nobody else upstairs to ask. No mirrors or peepholes.

You only get to go upstairs once, and you can't go back downstairs.

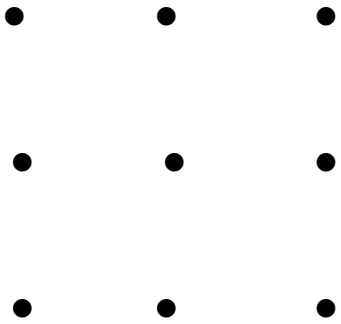
Hmmmmmmmmm. It can be done.

Jana Good

Tool 5: Think outside the box

The Nine Dot Problem

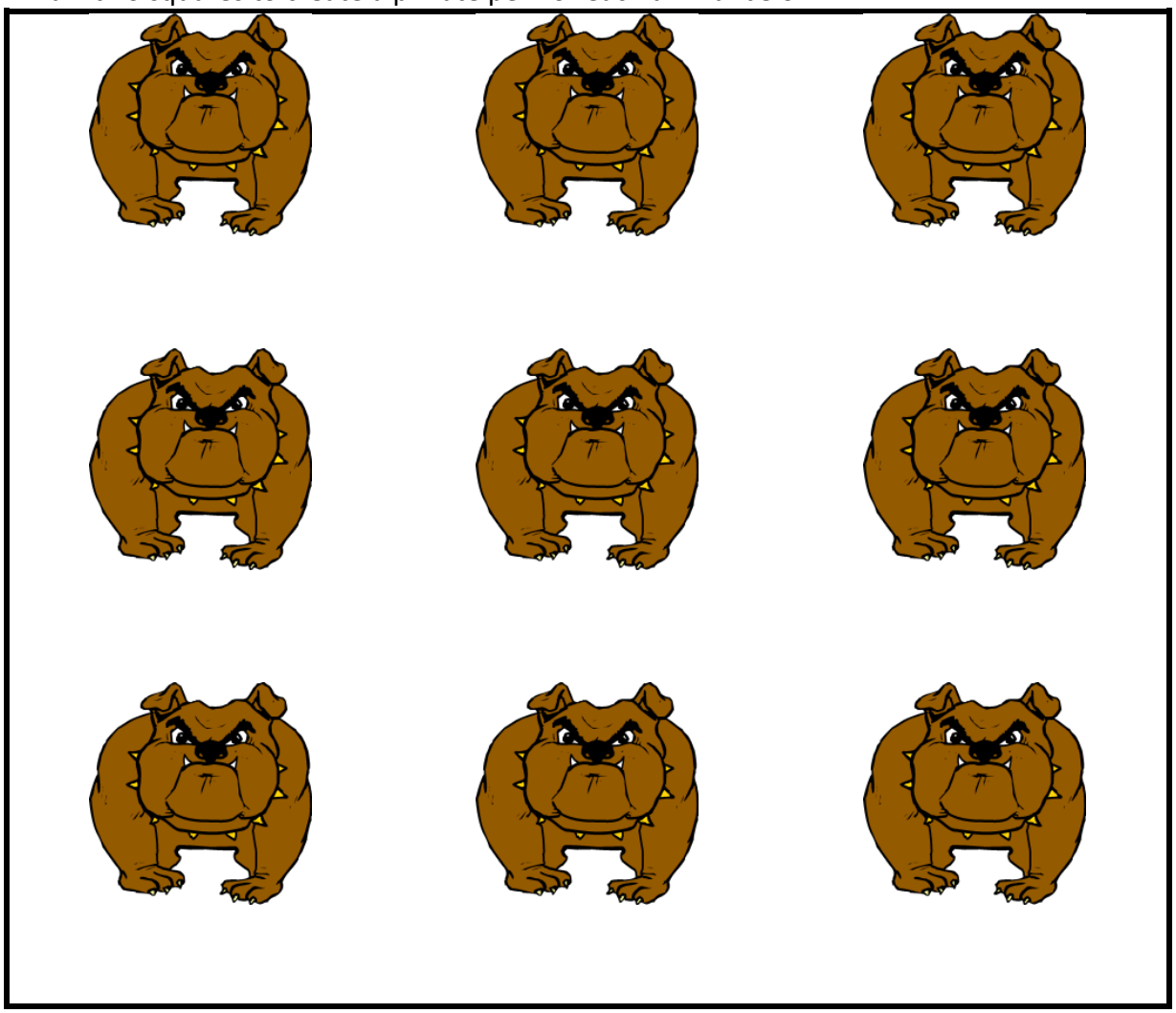
Without lifting your pencil, draw four straight lines through all nine dots, crossing each dot only once.



Tool 6: Don't be boxed in by previous solutions

The Animals Each Need a Pen

Draw two squares to create a private pen for each animal below



Tool 7: Use multiple thinking languages

In what ways can we express "half of eight?"

What is creativity?

Creativity	a mental process that involves the generation of new ideas or concepts, or new associations between existing ideas or concepts. Creativity typically involves imagination, inspiration and visionary thinking**.**
Innovation	the practical application of creative ideas to produce something that is original, novel or improved.
Rationality	a mental process that involves sound reasoning, logic and common sense

A Creativity Test

Part I.
The following test of creativity takes only three minutes. Read the directions, and then time yourself as you write down your answers. The test is:

In the space below, write down of all the possible uses for an empty tin can you can think of.

Part II.

You have just taken an adapted version of a creativity test developed by Dr. J.P. Torrance. This tests your ability to make many connections and illustrates how divergent your thinking is.

Four Elements of Creativity

Fluency	the ability to generate lots of ideas (i.e. how many ideas did you generate?)
Flexibility	the ability to generate ideas in a number of categories (i.e. container, toy, tool, communication device, etc.)
Originality	the ability to generate unique and unusual ideas or unexpected applications (i.e. a hat for dolls)
Elaboration	1. the ability to add details or to expand on the item itself (i.e. melt the can, grind it up, paint it, stack it with another can)

Stages of the Creative Process

Stage	Description
Preparation	• Laying the ground work • Gathering background information • Gaining knowledge and experience • Developing skills
Concentration or saturation	• Becoming totally absorbed in the problem or situation • Being immersed in the problem, the data, the possibilities
Incubation	• Taking time out • Resting • Turning the process over to the unconscious mind • Seeking distractions
Illumination	• Having the "aha" • Getting the "eureka of insight" or the great idea • Seeing a connection or solution • Knowing what to try next
Evaluation or verification	• Testing ideas by taking them through a checklist of criteria for practical application • Getting feedback from others • Checking assumptions • Running a pilot project • Modifying or improving

Innovation	• the solution to a practical problem or situation • Bringing the idea into being—product, service, process • Planning change • Managing change

Other Routes to creativity (aka "dumb luck")

Serendipity	• Accidental discovery or development of a new idea; random coincidence
Synchronicity	• Meaningful coincidence; something beyond random chance or cause-effect patterns happens in our lives.
Chaos	• Re-figuring or patterning of a complex system; unpredictable; no clear cause-effect

Tool 9: Idea Generation

A. Brainstorming

Brainstorming helps groups of people generate alternatives without prematurely evaluating, hence discarding, and "infant ideas."

Rules for brainstorming	Rationale
1. Generate as many ideas as possible.	Quantity takes precedence over quality. Emphasizing quality engenders evaluation and judgment
2. List all ideas where everyone can see them.	Ideas people can see spark other ideas
3. No criticism, judgment or discussion.	Energy is spent generating ideas, not defending them.
4. Encourage wild thinking and free- wheeling.	It is easier to tighten alternatives than to loosen them up.
5. Piggy-backing is encouraged.	Silly, half-baked or poor ideas may be altered become good ideas or they may spark other ideas that turn out to be good ones.

B. Brain-writing

A small group of people sit around a table. Each person writes one idea on a piece of 81/2 x 11 papers, folds the paper over to hide the idea and passes it left. Without looking at what has been written before, each person writes another idea, folds the paper and passes it left.

C. Affinity Diagrams (Silent Idea Generation)

Affinity diagrams are useful for describing problems and issues that are difficult to discuss for any reason, or when here is a great deal of information. The method is especially useful for: surfacing lots of information in a short period of time, without discussion or evaluation. It is likewise useful for revealing similarities and difference in information and opinions. The tool works well with a small group and can be adapted to larger groups, as well.

Steps:

1. Briefly identify a problem or an issue.

2. Individuals generate ideas, writing one per sticky note. The emphasis is on producing a great volume of ideas without judgment or evaluation, as in brainstorming.

3. Individuals post their sticky notes randomly on a whiteboard or wall.

4. Working in groups of three or four, everyone moves similar sticky notes together, forming themes or categories.

5. Groups create headers or titles on larger sticky notes for each theme or category.

For larger groups:

6. Groups move around the room to see the themes or categories and ideas other groups have created.

7. Two or three groups combine their themes or categories and ideas onto one board.

Tool 10: Statistical Tools for improvement and problem solving from total quality management

To understand processes or systems	• Flow charts • Process charts • Deployment charts • Opportunity flowcharts
To collect data	• Check sheets • Concentration diagrams • Work-flow diagrams
To look at data relationships	• Pareto charts • Time plots • Control charts • Frequency plots • Cause-effect diagrams • Scatter plots

Suggested Reading

Adams, James L (2001), *Conceptual Blockbusting: A Guide to Better Ideas*
Ayan, Jordan (1997), *Aha: 10 Ways to Free Your Creative Spirit and Find Your Great Ideas*
Buzan, Tony (1991), *Use Both Sides of Your Brain: New Mind Mapping Techniques*
Buzan, Tony (2005), *Mind Maps at Work*
Csikszentmihalyi, Mihaly (1996), *Creativity: Flow and the Psychology of Discovery and Invention*
deBono, Edward (1999), *Six Thinking Hats*
deBono, Edward (1973), *Lateral Thinking: Creativity Step by Step*
DeGraff, J. & K.A. Lawrence (2002), *Creativity at Work: Developing the Right Practices to Make Innovation Happen*
Gloor, Peter (2006), *Swarm Creativity: Competitive Advantage through Collaborative Innovation Networks*
Goldenberg, Jacob & David Mazuwsky (2002), *Creativity in Product Innovation*
Gordon, W. J.J. (1961), *Synectics: The Development of Creative Capacity*
Gryskiewicz, Stanley & Sylvester Taylor (2007), *Making Creativity Practical: Innovation that Gets Results (Center for Creative Leadership)*
Gutsche, Jeremy (2009, *Exploiting Chaos*
Harvard Business Essentials (2003), *Managing Creativity and Innovation*
Kao, John J. (1996), *Jamming: The Art and Discipline of Business Creativity*
Kelly, Tom, Jonathan Littlman & Tom Peters (2001), *The Art of Innovation: Lessons in Creativity from IDEO, America's Leading Design Firm*
Kelly, Tom & Jonathan Littman (2005), *The Ten Faces of Innovation: Ideo's Strategies for Defeating the Devil's Advocate and Driving Creativity Throughout Your Organization*
Mauzy, Jeff & Richard Harriman (2003), *Creativity, Inc: Building an Inventive Organization*
Michalki, Michael (2001), *Cracking Creativity*
Osborn, Alex (1993, 1979, 1953), *Applied Imagination*
Osborn, Alex (2008. 1988), *A Whack on the Side of the Head*
Osborn, Alex (1986), *A Kick in the Seat of the Pants*
Raudsepp, Eugene (1981), *How Creative Are You?*
Ray, Michael & Rochelle Myers (1988), *Creativity in Business*
Robinson, Alan & Sam Stern (1998), *Corporate Creativity*
Sawyer, Keith (2002), *Group Genius: The Creative Power of Collaboration*
Sawyer, Ruth (2006), *Explaining Creativity: The Science of Human Innovation*
Taylor, Jill (2008), My Stroke of Insight
von Stamm, Bettina (2008), *Managing Innovation, Design and Creativity*